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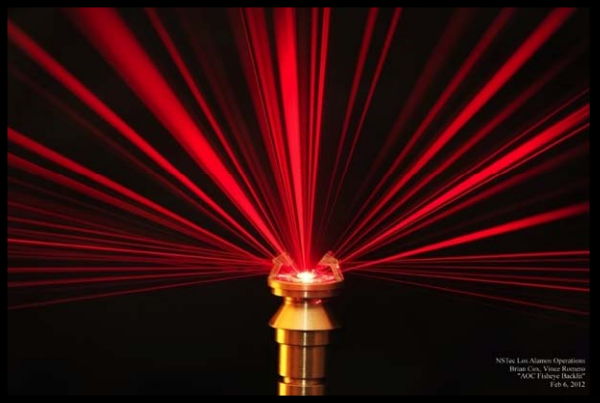
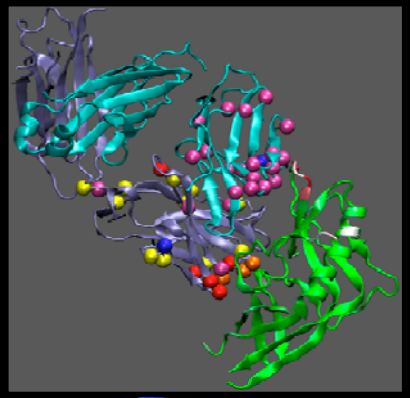
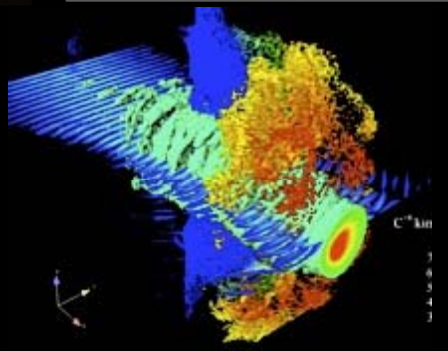


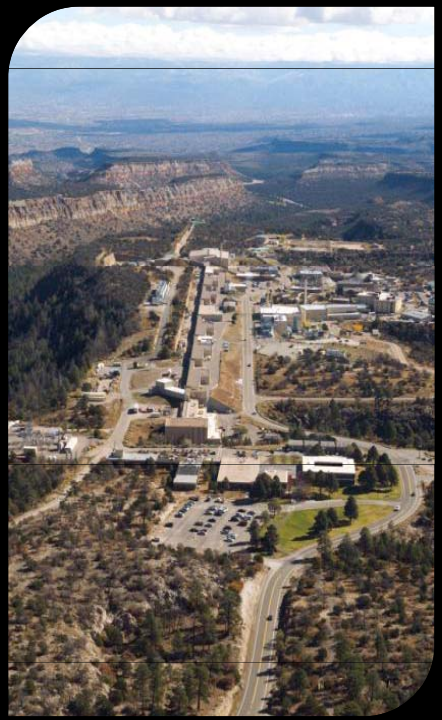


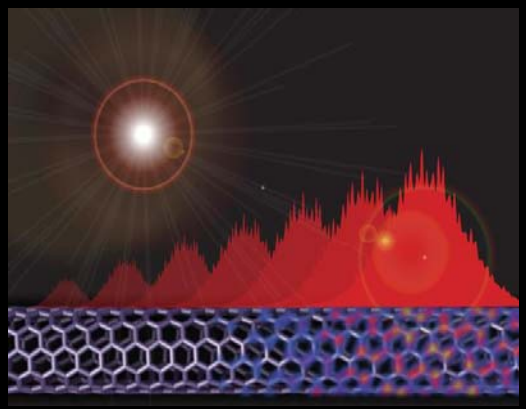
LANL Energy Strategy

John Sarrao
Program Director

February 1, 2013
UNCLASSIFIED







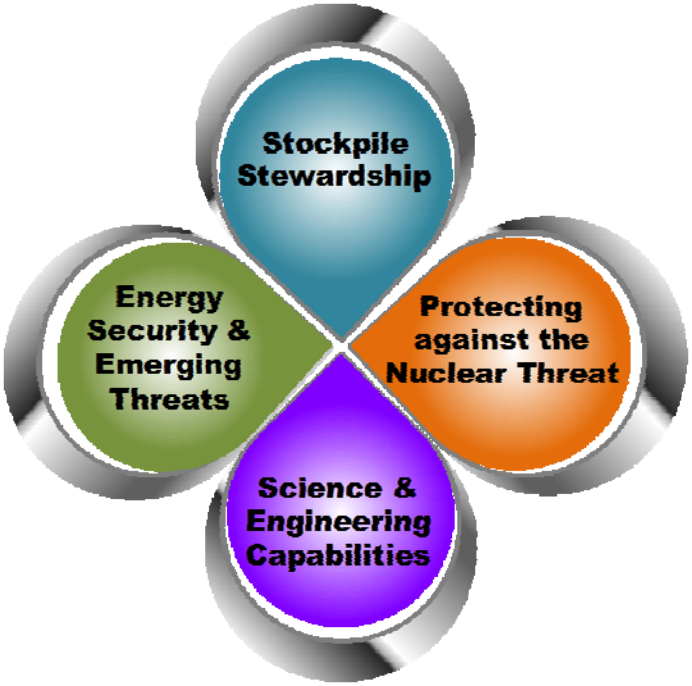
Energy security breakthroughs with global impacts

- Hydrogen fuel cells
- Algal biofuels
- Impacts of growth in energy demand
- Safer nuclear reactors
- Energy infrastructure

In a world with limited resources, energy is national security

Los Alamos:
Where Great Mission and Science frontiers meet

Our strategy as a multi-program national security capability laboratory **is to develop and apply the best science, technology, and engineering solutions to the toughest national security missions:**



- Multidisciplinary science, technology, and engineering challenges
- Problems demanding unique experimental and computational facilities
- Highly complex security issues requiring fundamental breakthroughs

People → Capability → Mission Impact

ST&E Pillars—and their integration—provide *cross-cutting capability focus* for our national security missions

LANL Missions

National Security Science

Nuclear Deterrence	Global Security	Energy & Emerging Threats

Program Execution

Science of Signatures

discover signatures, revolutionize measurements, and forward deployment

Integrated assets for complex missions

Materials for the Future

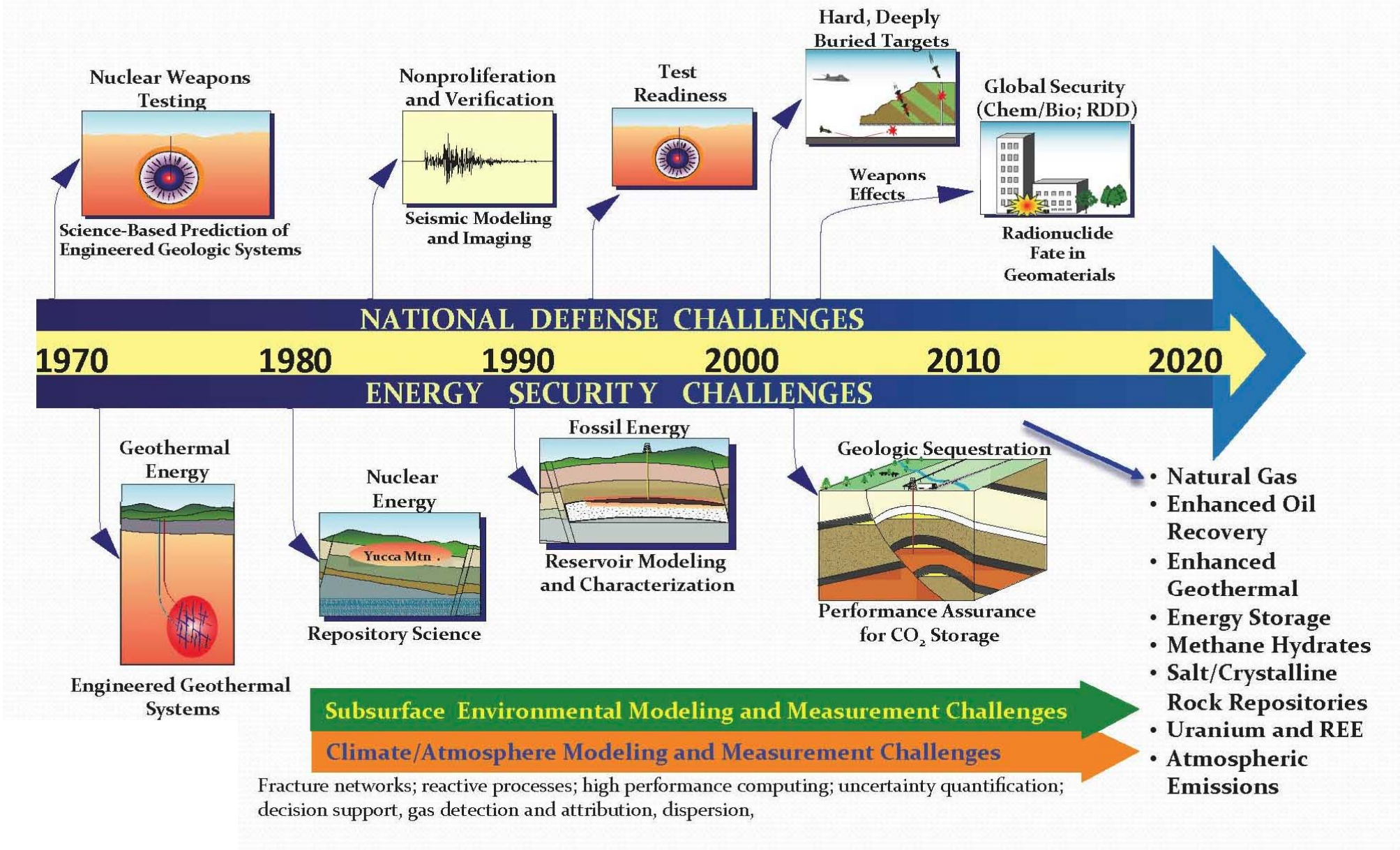
defects and interfaces, extreme environments, and emergent phenomena

Information, Science, and Technology for Prediction

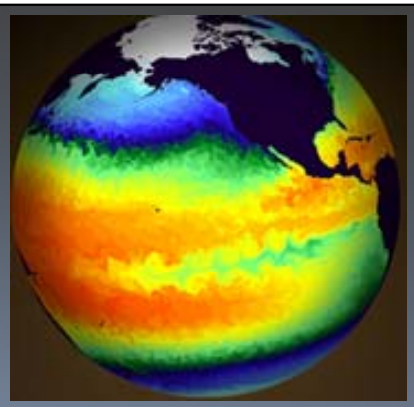
data science at scale, computational co-design, and complex networks

Los Alamos is a nexus for advancing the nation's security & prosperity

Sustaining Capabilities:
e.g., LANL's Enduring Subsurface Energy Security History

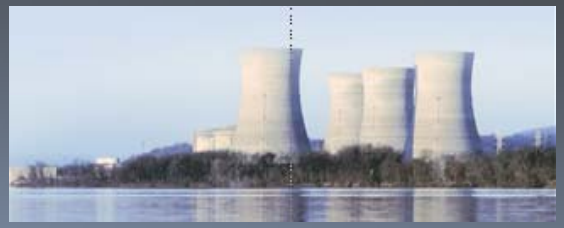


Los Alamos Energy Security Focus Areas



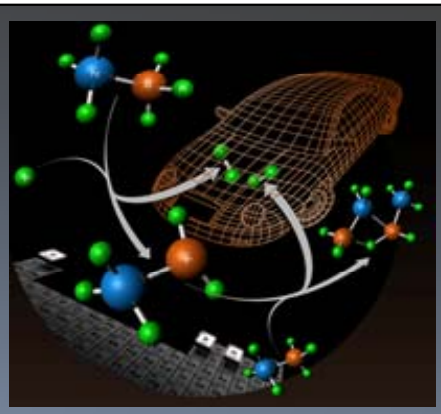
Impacts of Energy Demand Growth

- Coupled predictive models for climate, infrastructure impact analysis
- Prediction of abrupt change at multiple scales (regional to global)
- Global security and policy implications



Sustainable Nuclear Energy

- Efficient extraction of energy content from fuel
- Nonproliferation & safeguards
- Effective waste management



Concepts and Materials for Clean Energy

- Energy storage, generation, and transmission
- Revolutionary alternatives to petroleum
- Clean fossil energy

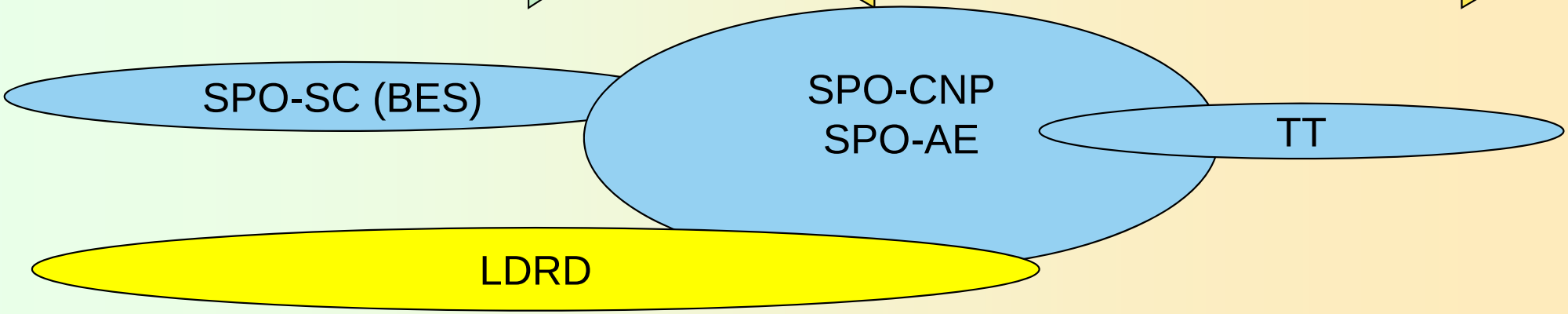
Funding Agencies for Energy R&D have specific missions relative to "technology readiness"

Grand Challenges	Discovery Research	Use-Inspired Basic Research	Applied Research	Technology Maturation & Deployment
▪ Basic research to address fundamental limitations of current theories and descriptions of matter in the energy range important to everyday life – typically energies up to those required to break chemical bonds. ▪ Particularly challenging are the failures to understand systems that are ultrasmall or isolated or that display emergent phenomena of many kinds.	▪ Basic research for fundamental new understanding on materials or systems that may revolutionize or transform today's energy technologies ▪ Development of new tools, techniques, and facilities, including those for advanced modeling and computation	▪ Basic research for fundamental new understanding, usually with the goal of addressing showstoppers on real-world applications in the energy technologies	▪ Research with the goal of meeting *technical milestones*, with emphasis on the development, performance, cost reduction, and durability of materials and components or on efficient processes ▪ Proof of technology concepts	▪ Scale-up research ▪ At-scale demonstration ▪ Cost reduction ▪ Prototyping ▪ Manufacturing R&D ▪ Deployment support

BESAC & BES Basic Research Needs Workshops

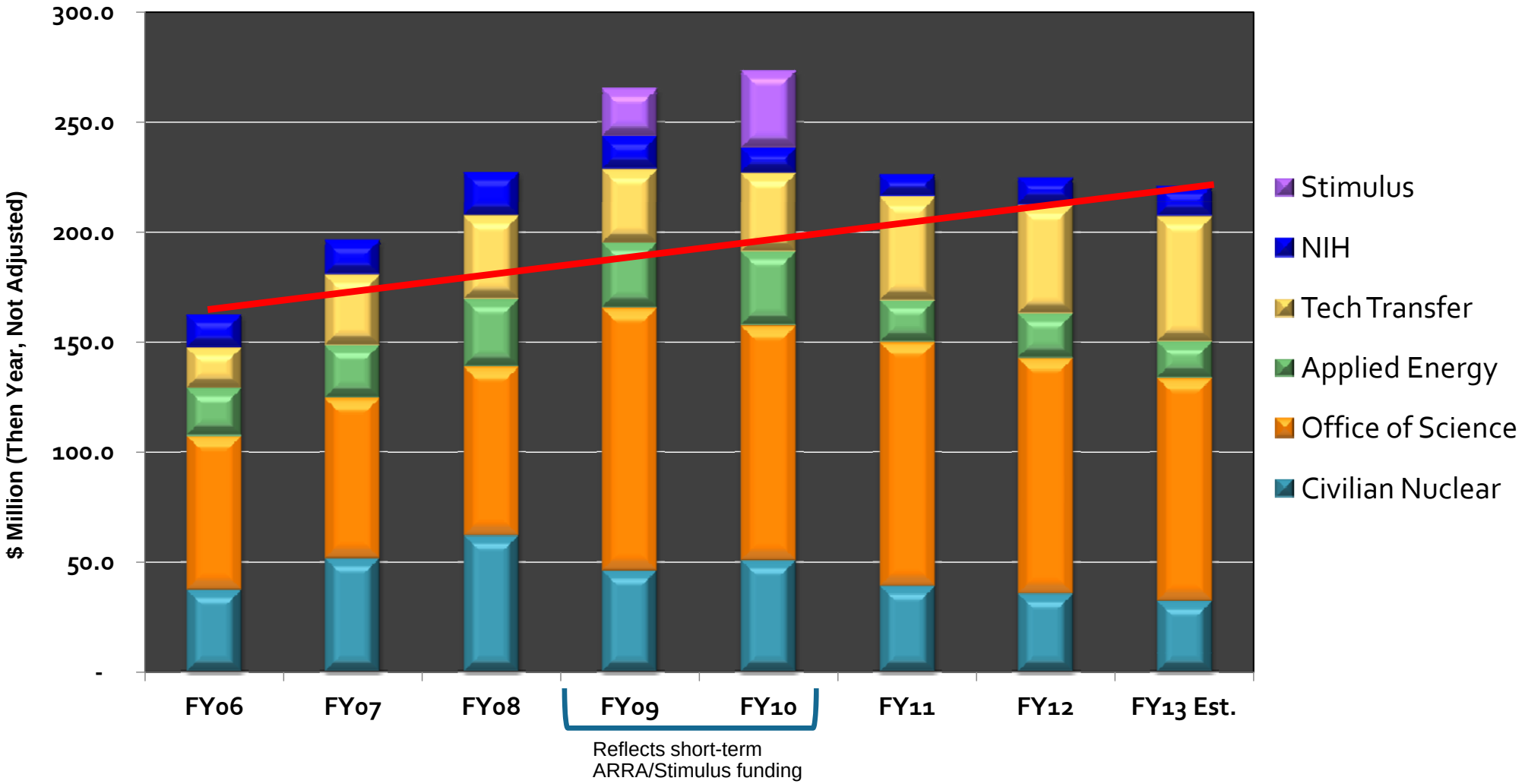
BESAC Grand Challenges Panel

DOE Technology Office/Industry Roadmaps



Energy & Science Programs:
Record of growth

Our Energy and Science Programs have grown into a diverse portfolio; partnerships help sustain that growth and impact.



Partnerships: National partnerships for major modeling and simulation tools for DOE missions

CCSI™
Carbon Capture Simulation Initiative

CCSI: A 5-Lab, multi-university, multi-industry initiative chartered by the President to accelerate carbon capture deployment. Los Alamos leads Basic Data & Models team and is a key contributor to Particle & Device Scale team and the Uncertainty Quantification team. From first review in October: "*…Progress impressive, well beyond what they might have expected at this point in the program, and the program continues to be very well coordinated...*"

NETL · Berkeley Lab · Lawrence Livermore National Laboratory · Los Alamos National Laboratory · Pacific Northwest National Laboratory · U.S. Department of Energy

Consortium for Advanced Simulation

Of Light Water Reactors

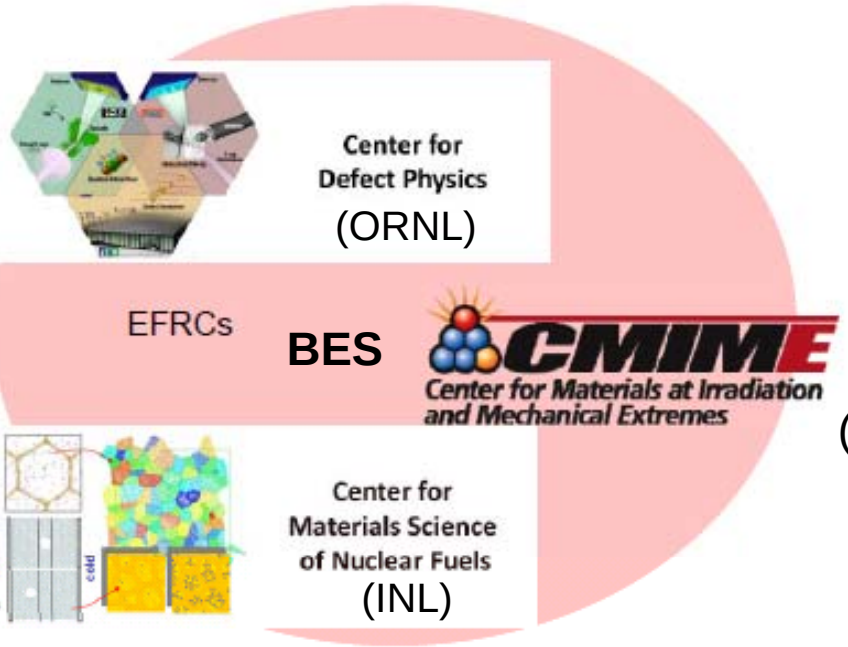
ASCEM

ASCEM (Advanced Simulation Capabilities for Environmental Management): A consortium of 5 Labs to develop transformational, HPC modeling to improve our ability to predict movements of underground contaminants and minimize ES&H risks across the DOE Complex.

Berkeley Lab · Los Alamos National Laboratory · Pacific Northwest National Laboratory · Oak Ridge National Laboratory · SRNL

Integration: Synergy from basic science to applied research are key to our success and impact

Fundamental Materials Science



Reactor Simulations

CASL

NE (ORNL, INL, LANL, MIT, et al.)

ExMatEx

ASCR(LANL, LLNL, et al.)

Advanced Computing

Leveraging our intellectual assets through strategic "win-win" partnerships: Deliberate, large growth over last decade

Technology Transfer

Results from our reliability technology partnership with Los Alamos will reduce P&G costs by $1.5B annually.

Mark Peterson, Procter&Gamble

Labs & Universities

Student and Postdoc Programs

Students: ~1250 in FY12
Postdocs: ~ 450 in FY12

International Partnerships

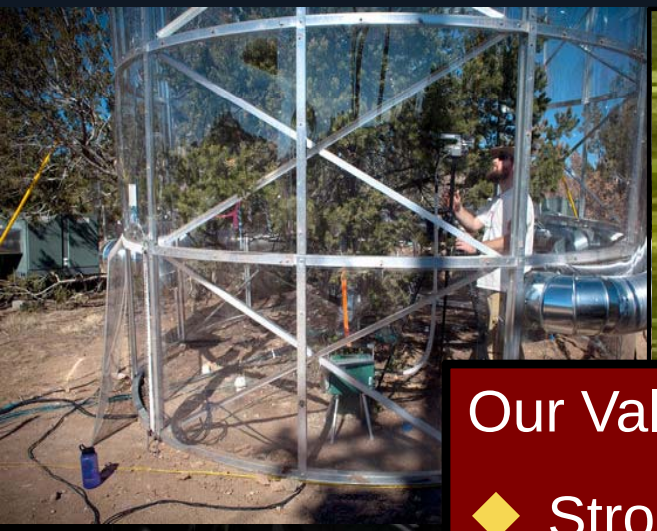
Smart house with
Los Alamos County

New Mexico Consortium

PRObE Supercomputing Center ribbon-cutting

NSF

Energy Security will continue to be an increased mission area for Los Alamos



Our Value Proposition comes from

- Strong core capabilities
- National security mission leverage
- Partnerships with premier institutions